A Revision of the Seguenziacea Verrill, 1884 (Gastropoda: Prosobranchia). II. The New Genera *Hadroconus*, *Rotellenzia*, and *Asthelys*

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ABSTRACT

Three new genera of the superfamily Seguenziacea are proposed. *Hadroconus* is erected for two western Atlantic and one western Pacific species formerly assigned to *Basilissa* Watson, 1879. Another species, *Basilissa lampra* Watson, 1879, is here made type-species of the monotypic genus *Rotellenzia*. One specimen from the syntype series of *Carenzia carinata* (Jeffreys, 1877) from the North Atlantic Ocean is a juvenile of *Basilissa munda* Watson, 1879, which is here established as type-species of *Asthelys* new genus; *Basilissa simplex* Watson, 1879, is also assigned to this genus. Shells of *Hadroconus altus* (Watson, 1879), *Rotellenzia lampra* (Watson, 1879), and *Asthelys munda* (Watson, 1879), are described and illustrated by SEM micrographs and/or light photographs. Comments on utility of shell and radular characters for generic definitions are presented.

INTRODUCTION

The systematics of the Seguenziacea Verrill, 1884, has undergone extensive examination and revision during the last 5 years. Prior to 1983, only six valid genera had been established. An equal number of new genera were erected in 1983 [Marshall, 1983 (5); Quinn, 1983a (1)]. Subsequent research on the western Atlantic fauna has revealed two additional genera, and examination of the unique specimen of *Basilissa lampra* Watson, 1879, makes a third new genus necessary.

In a previous paper (Quinn, 1983b), I noted that shell characters were useful in distinguishing between taxa and, in most cases, were the only characters available at the species and genus levels. For example, differences in size of protoconch, number and distribution of primary and secondary sculptural elements (*e.g.*, spiral carinae, cords, threads, collabral riblets), features of the intersection of the sculptural elements (*e.g.*, nodulose or smooth, sharp or rounded nodules, laterally compressed or not), type of columellar tooth, *etc.*, are important in species discriminations. Some characters, especially shell proportions, may or may not be adequate for species distinctions and must be evaluated on a case-by-case basis.

Ideally, delimitations of genera should entail analyses of shell, radular, and anatomical characters. That ideal is hampered in the Seguenziidae by lack of material available for dissection (see summary in Quinn, 1983b). As a result, all genera have been established principally on the basis of subjective evaluations of shell features, sometimes augmented by a description of the radula. Despite this approach, with the attendant potential for unnecessary generic splitting, authors prior to 1970 were very conservative in erecting new genera. In three recent papers (Marshall, 1983; Quinn, 1983a,b), generic concepts of seguenziids have been refined, again based principally on conchological characters, but no author has presented a discussion of shell characters that, when used in combination, are useful in delimiting genera. I take the opportunity to do so here.

Shell shape: With few exceptions, shell shape gives a good first approximation of generic placement. The following definitions of shell shape will be used in this and subsequent papers: (1) conical—spire height greater than aperture height, sides of spire flat or almost so, sutures not impressed, base flat to weakly convex (*Thelyssa* Bayer, 1971; *Thelyssina* Marshall, 1983; *Basilissa* Watson, 1879; *Hadroconus* new genus; *Asthelys* new genus); (2) depressed conical—similar to (1) but spire height approximately equal to aperture height and base rather strongly convex (*Fluxinella* Marshall, 1983; *Rotellenzia* new genus); (3) conico-turbinate—spire height greater than aperture height, spire weakly to strongly gradate, sutures weakly to strongly impressed, base flat to weakly convex (*Aneistrobasis* Dall, 1889; *Carenzia* Quinn, 1983; *Seguenziella* Marshall, 1983; *Basilissopsis* Dautzenberg and Fischer, 1897; *Seguenziopsis*, Marshall, 1983); (4) ovate-conical—spire height greater than aperture height, sides of spire flat or almost so, sutures weakly impressed, base strongly convex [*Seguenzia* Group III of Quinn, 1983b (this group being described by Marshall, personal

communication)]; and (5) ovate-turbinate—similar to (4) but with spire strongly gradate and sutures often strongly impressed (*Seguenzia* Jeffreys, 1876; *Guttula* Schepman, 1908).

Midwhorl angulation: Presence or absence of a midwhorl angulation is consistent within genera, with one exception (see below). "Midwhorl angulation" includes any angulation that is formed along, although not necessarily confluent with, the anterior (abapical) edge of the posterior labral sinus and is usually weaker than the peripheral carina. Only one genus (*Guttula*) lacks any trace of this angulation at any stage of growth. Among those with an angulation, there are three variations: (1) angulation initially absent, forming on second half of first whorl, then disappearing again later in ontogeny (*Thelyssina* and *Asthelys*); (2) angulation initially present but becoming obsolete or absent after first one to three whorls (*Basilissa*, most *Ancistrobasis*, *Thelyssa*, *Fluxinella*, *Carenzia*, and *Hadroconus*); and (3) angulation present on all whorls, often becoming a strong carina (all other genera, plus *Ancistrobasis regina* Marshall, 1983).

Axial sculpture: Axial sculpture above the periphery usually comprises fine, sharp threads to strong cords tracing, more or less exactly, the outline of the outer lip, but is absent in a few genera. I use the term "sigmoid" to denote the simple reversed S-shape, exemplified by *Ancistrobasis*, and "collabral" for the more complex configuration seen in *Seguenzia* (for general discussion I include both types in the less precise term "axial"). Again, this sculpture falls into several categories: (1) absent on all whorls (*Guttula*, *Fluxinella*, *Thelyssina*, *Seguenziopsis*, and *Asthelys*); (2) initially present on first one or two whorls as sharp, collabral threads, becoming weak, sigmoid threads on subsequent whorls, or disappearing completely except for plications near the sutures, nodulation of the midwhorl angulation, and/or plications on or crenulation of the peripheral carina (*Thelyssa*, *Seguenziella*, *Carenzia*, *Rotellenzia*, and *Hadroconus*); (3) initially present on first one or two whorls as sharp, collabral threads and persisting on all subsequent whorls as strong, rounded, sigmoid cords (*Basilissa*, *Ancistrobasis*, and *Basilissopsis*); and (4) present on all whorls as fine, sharp collabral threads (*Seguenzia* and *Seguenzia* Group III). The axial sculpture may extend onto the base as transverse riblets or threads. The inclination of the axial riblets with respect to the suture line (*i.e.*, an imaginary line connecting the intersections of the riblet ends with the sutures) is useful as an additional character for distinguishing between genera that have similar shell morphologies and sculptural types. At least two cases are known for which this comparison obtains: in *Basilissa* the axials are prosocline, but in *Ancistrobasis* they are opisthocline; in *Thelyssa* the axials are prosocline, but in *Hadroconus* they are opisthocline.

Labral sinuses: The number of labral sinuses in the shell lip is one of the more important characters, if not the most important, in seguenziid systematics. Absence of a sinus in the shell lip does not necessarily reflect a corresponding lack of a sinus in the mantle edge, nor do the shapes of axial riblets necessarily reflect the exact shape of the posterior sinus. Most seguenziid genera have either two or three sinuses (see Marshall, 1983; Quinn, 1983b). *Guttula* alone has none, and *Thelyssina* seemingly has only one. *Seguenzia*, previously defined in part by presence of three sinuses, actually has a fourth (a wide, open, flared extension of the basal lip, rarely preserved in either dead- or live-collected material) located in the extreme inner (adaxial) part of the basal lip; this sinus corresponds to a papillate sinus in the mantle (Quinn, 1983b).

The shape of the posterior sinus has been described as J-, reversed L-, U-, or V-shaped (Quinn, 1983b). However, this actually was a description of the shape of the axial riblets in the selenizone behind the sinus itself. (1) The J- and reversed L-shapes are merely variations on a common theme in which the lower arm of the sinus is essentially parallel to the suture line, and the apex (closed end) is broadly and evenly rounded (*Seguenzia*, *Seguenzia* Group III, *Hadroconus*, and possibly *Thelyssa*). (2) The V-shape is that in which the upper and lower arms of the sinus are divergent and the apex is narrowly rounded (*Carenzia*, *Seguenziella*, *Fluxinella*, *Rotellenzia*). (3) The U-shape should actually, and loosely, be termed "broadly U-shaped", because the apex is very broadly and evenly rounded, but the upper and lower arms of the sinus are divergent, not parallel (*Ancistrobasis*, *Basilissopsis*, *Asthelys*, and probably *Basilissa*). (4) The sinus edge in *Seguenziopsis* apparently sweeps forward in a sigmoid, opisthocline line with the posteriormost point at the suture.

As indicated above, the true shape and depth of the posterior sinus is not necessarily reflected in the shape of the axial sculpture. For example, in *Hadroconus* the sigmoid axial threads suggest a very shallow, broadly U-shaped sinus similar to that of *Ancistrobasis*, but the sinus of the former is actually considerably deeper than that of *Ancistrobasis*, and the lower arm is parallel, or nearly so, to the suture line. However, in *Ancistrobasis*, *Basilissopsis*, and probably *Basilissa*, the sigmoid axials accurately trace the sinus (Marshall, 1983; Quinn, 1983b, unpublished observations). This does not, however, obviate the systematic value of the shapes of axials for discriminating between closely related taxa (Quinn, in preparation).

Depth of the posterior sinus is defined here by arbitrary sinus depth: shell diameter ratios (X)—very shallow = $X < 0.10$; shallow = $0.10 < X < 0.20$; moderate = $0.20 < X < 0.30$; deep = $X > 0.30$.

Umbilicus: The presence, absence, and relative width of the umbilicus may or may not be of systematic significance at the generic level; characteristics of the umbilicus usually are useful only at the species level. However, presence of an umbilical septum is a rare feature in the Seguenziidae, as it also is in the Trochacea. An umbilical septum is known only in *Basilissa superba*

Watson, 1879, and *Thelyssa callisto* Bayer, 1971, and is here considered autapomorphic in both genera.

Radula: The superfamily has been characterized by the presence of a single pair of lateral teeth and more than two pair of marginal teeth in each radular tooth-row (Quinn, 1983b). Including the three new genera defined here, radulae have been illustrated for nine of the fifteen described genera (including *Seguenzia* Group III). These illustrations seem to indicate three distinct types of lateral teeth: (1) Type I is broadly triangular, with the denticulate cusp not narrowed (*Ancistrobasis*, *Fluxinella*, *Hadroconus*, and *Guttula* in part); (2) Type II has a broad, triangular base, but with a long, narrow cusp arising from the proximal corner (*Seguenzia*, *Seguenziella* and *Botellenzia*); and (3) Type III is a simple, triangular tooth base lacking a cusp (*Guttula* in part, *Carenzia*, and *Seguenzia* Group III). At present, structure of the rhachidian and number of marginals cannot be satisfactorily categorized.

In summary, characters of genus-level importance include shell shape, expression and persistence of a mid-whorl angulation, expression and shape of axial sculpture, shape of the posterior labral sinus, presence or absence of an umbilical septum, and shape of the lateral tooth of the radula. The number of labral sinuses is probably significant at higher taxonomic levels. Features not necessarily useful for discrimination of genera include presence or absence of an umbilicus or columellar tooth and, in most cases, spiral sculpture. However, it must be stressed that all characters must be used in combination, and anatomical characters should also be included when available. I believe that, although anatomical details are lacking for most described genera, and radulae are unknown for several, basing genera principally on shell characters still has validity in the Seguenziidae, and I am confident that anatomical characters, when known, will confirm the validity of most, if not all, seguenziid genera now defined on conchological characters.

Institutional abbreviations used in this paper are: BM(NH), British Museum (Natural History); MCZ, Museum of Comparative Zoology, Harvard University; MNHN, Museum National d'Histoire Naturelle, Paris; TAMU, Systematic Collection of Marine Organisms, Texas A&M University; UMML, Rosenstiel School of Marine and Atmospheric Science, University of Miami; USNM, U.S. National Museum of Natural History.

Hadroconus new genus

Basilissa Watson, 1879:593 (*partim*); 1886:96 (*partim*).—Martens, 1881:56 (*partim*).—Dall, 1881:48; 1885:34 (*partim*); 1889a:32, 384 (*partim*); 1889b:164–165 (*partim*); 1890: 354; 1927:109 (*partim*).—Fischer, 1885:827 (*partim*).—Pilsbry, 1889:15, 419 (*partim*).—Schepman, 1908:61 (*partim*).—Maury, 1922:157 (*partim*).—Thiele, 1929:48 (*partim*).—Johnson, 1934:73 (*partim*).—Wenz, 1938:276 (*partim*).—Cotton, 1959:189 (*partim*).—Keen and Cox, 1960 1250 (*partim*).—Clarke, 1962:12 (*partim*).—Bayer, 1971: 123.—Abbott, 1974:39 (*partim*).—Quinn, 1979:49 (*partim*); 1981:74 (*partim*); 1983b:729 (*partim*).—Goryachev, 1979:70 (*partim*).—Boss, 1982:974 (*partim*).

Seguenzia: Dall, 1881:48 (*partim*).

Type-species: *Basilissa alta* Watson, 1879; here designated.

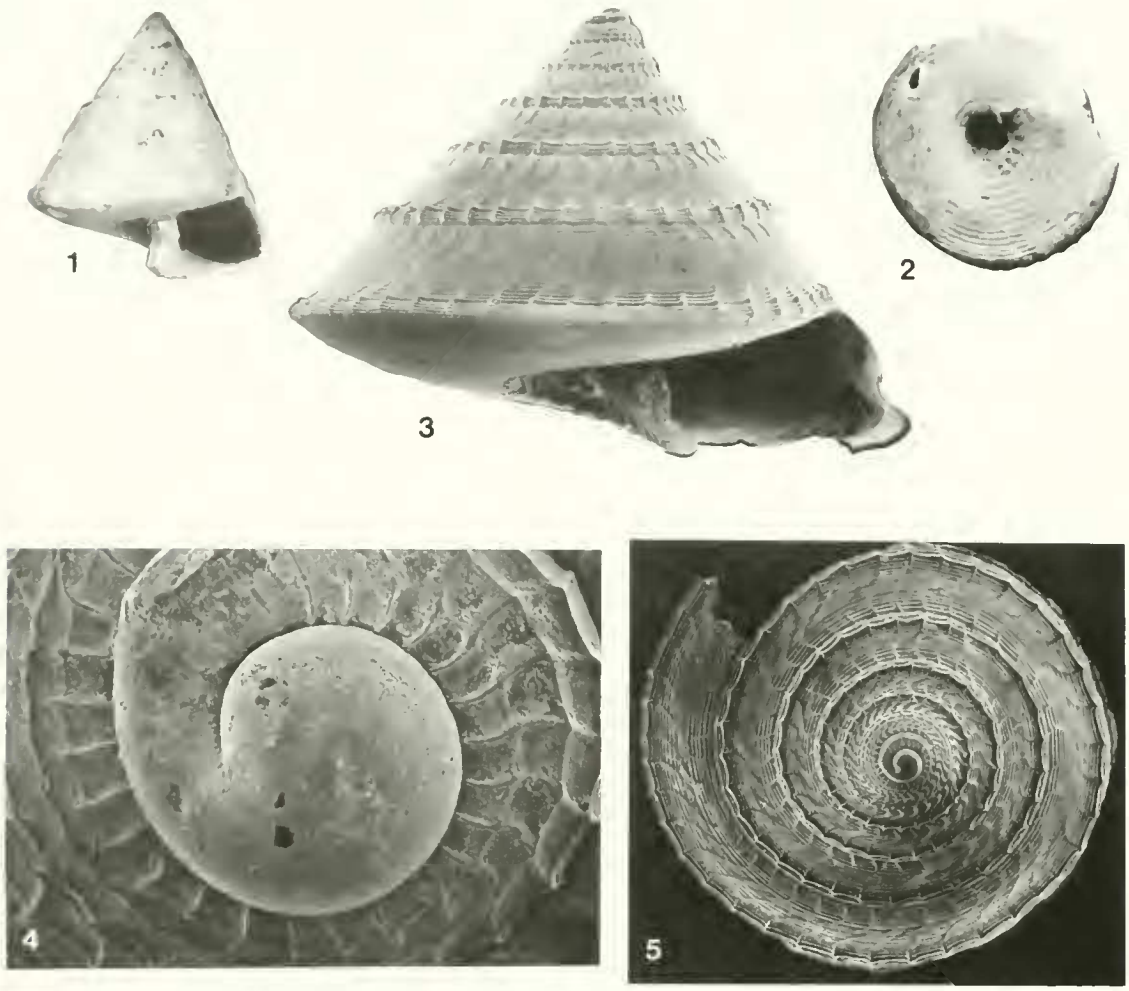
Gender: Masculine.

Diagnosis: Shell small, conical, peripherally carinate, umbilicate, nacreous under thin outer porcelaneous layer, white, polished; spire with flat to slightly concave sides, sculptured by widely spaced, sigmoid axial riblets, and fine spiral threads; periperal carina strong, overlaid with several spiral threads, crenulated by terminations of axial riblets; base slightly convex, with strong, flattened spiral cords and/or narrow threads; umbilicus wide, deep, funnel-shaped, bounded by strong, tuberculate cord; aperture subrectangular; outer lip thin, with shallow posterior sinus occupying adapical half of whorl, claw-like near periphery; basal lip thin, with wide, shallow sinus in outer part; columella straight, slightly oblique, somewhat inflated medially, terminating in a rounded boss.

Remarks: Cossmann (1888) designated *Basilissa superba* Watson, 1879, as type-species of *Basilissa* Watson, 1879, although *B. alta* Watson, 1879, has been the species most frequently associated with that genus. Because that type-designation may not be changed, *Hadroconus* is erected for *B. alta*, *B. sibogae* Schepman, 1908, *B. watsoni* Dall, 1927, and an undescribed western Atlantic species. Together, these four species form a morphologically cohesive species-group that may be distinguished from all other seguenziacean genera. Shells of these four species are small (< 10 mm), have spiral sculpture much weaker than axial riblets, or predominantly absent, the axial riblets are strongly sigmoid and opisthocline, and the umbilicus lacks a septum. Shells of *B. superba* are large (> 20 mm), have spiral sculpture subequal to axial riblets, axial riblets almost a simple prosocyrt arc except for a weak opisthocyrt sinuation near the adapical suture, axials weakly prosocline, and umbilicus partially covered by a septum. In addition, shells of *Hadroconus* species usually have height : width (h:w) ratios less than 1.0, those of *B. superba* greater than 1.0; however, two specimens of *H. altus* (UMML 30.8155) have h:w ratios of 1.03 and 1.07, and Okutani (1982) recorded two juvenile specimens of *B. superba* with h:w ratios of 0.96 and 0.98 (he did not indicate whether apical parts of these specimens are intact).

Shells of *Hadroconus* are most similar to those of *Thelyssa* Bayer, 1971, but differ in that the axial riblets are rather strongly sigmoid and opisthocline, and the umbilical walls lack callus and an umbilical septum. *Hadroconus* and *Thelyssa* are apparently sister taxa separated principally by the autapomorphic umbilical septum of *Thelyssa*.

Although I have not had an opportunity to examine a properly preserved specimen of any species of *Hadroconus*, dried specimens of both *H. altus* and *H. watsoni* were available for study and afforded the following ob-



Figures 1–5. *Hadroconus altus* (Watson, 1879). **1, 2.** Apertural and basal views of lectotype of *Basilissa alta*, BM(NH) 1887.2.9.351, height 6.3 mm, maximum diameter 5.9 mm. **3.** Apertural view of specimen from *Gerda* station G-965, UMML 30.7759 (SEM micrograph, × 9). **4.** Protoconch of another specimen from G-965 (SEM, × 140). **5.** Same, apical view (SEM, × 9).

servations of external anatomy. A well-developed epipodium bears four (or five) to six epipodial tentacles. The mantle edge has two broad sinuses, corresponding to the basal and posterior labral sinuses of the shell; mid-dorsally is a prominent, seemingly papillate tentacle, to the left of which is a narrow, C-shaped sinus which corresponds to the peripheral angulation of the shell. The esophagus, seen by transpareney after the animals were soaked in trisodium phosphate, extends posteriorly from the buccal area, sharply turns ventrally at the level of the last intestinal turn, and then runs posteriorly along the ventrolateral surface of the right intestinal tract. The intestine is similar to that of *Seguenzia* sp. *cf. S. eritima* Verrill, 1884 (Quinn, 1983b), but coils in the opposite direction; the shape of the fecal string is also similar to that of *Seguenzia*: oval with a shallow medial groove on one side. The cephalic tentacles are long, papillate, appressed basally, and a long, slender penis arises just to the right of the right cephalic tentacle. On either side of the snout is a prominent, paddle-shaped oral lappet.

Etymology: From the Greek *adros*, stout, strong, and *konos*, a cone.

Hadroconus altus (Watson, 1879)
(figures 1–5)

Basilissa alta Watson, 1879:597; 1886:100, pl. 7, fig. 8.—Martens, 1881:56.—Dall, 1881:48, 1885:34; 1889a:32, 384, 1889b:164–165, 1890:354.—Pilsbry, 1889:419, pl. 36, fig. 5.—Maury, 1922:157.—Johnson, 1934 73.—Cotton, 1959. 189.—Clarke, 1962:12.—Bayer, 1971:123, figs. 6D–G, 7A–D.—Abbott, 1974:37, fig. 239.—Quinn, 1983b:729, figs. 13, 28, 40.

Seguenzia delicatula Dall, 1881:48, 1885:265.

Basilissa alta var. *oxytoma* Watson, 1886:100, pl. 7, fig. 8a.—Pilsbry, 1889:421, pl. 36, fig. 4.

Basilissa alta var. *delicatula*: Dall, 1889a:384, pl. 22, figs. 2, 2a; 1889b:164–165.—Pilsbry, 1889:421, pl. 48, figs. 3, 4.—Maury, 1922:158.

Basilissa delicatula delicatula: Johnson, 1934 73.

Basilissa (Basilissa) alta: Quinn, 1979:50, figs. 83, 84.

Material examined: 1 specimen, UMML 30.8156; *Columbus Iselin* sta. CI-356, 24°28.3′N, 77°29.5′W, 1,597 m; 40 foot otter trawl; August 20, 1975.—1 specimen, UMML 30.8146; *Gerda* sta. G-478, 24°15′N, 82°11′W, 343–348 m; 10 foot otter trawl; January 26, 1965.—3 specimens, UMML 30.8152; *Gerda* sta. G-967, 24°15′N, 82°26′W, 499–503 m; 10 foot otter trawl; February 2, 1968.—1 specimen, UMML 30.8018; *Gerda* sta. G-1099, 24°12.5′N, 82°50′W, 622 m; 10 foot otter trawl; April 28, 1969.—1 specimen, UMML 30.8144; *Gerda* sta. G-356; 24°11′N, 81°37′W, 672 m; 10 foot otter trawl; September 15, 1964.—1 specimen, UMML 30.8151; *Gerda* sta. G-966, 24°10′N, 82°22′W, 553–558 m; 10 foot otter trawl; February 2, 1968.—1 specimen, UMML 30.8147; *Gerda* sta. G-815, 24°08′N, 79°48′W, 618 m; 10 foot otter trawl; June 27, 1967.—1 specimen, USNM 94941; *Blake* sta. 43, 24°08′N, 82°51′W, 620 m.—1 specimen, UMML 30.8145; *Gerda* sta. G-370, 23°54′N, 81°19′W, 1,281 m; 16 foot otter trawl; September 16, 1964.—1 specimen, UMML 30.7764; 2 specimens, UMML 30.8150; *Gerda* sta. G-964, 23°46′N, 81°51′W, 1,390–1,414 m; 10 foot otter trawl; February 1, 1968.—5 specimens, UMML 30.7759; *Gerda* sta. G-965, 23°45′N, 81°51′W, 1,394–1,399 m; 10 foot otter trawl; February 1, 1968.—1 specimen, UMML 30.8022; *Gerda* sta. G-1112, 23°44′N, 81°14′W, 2,276–2,360 m; 10 foot otter trawl; April 30, 1969.—1 specimen, MCZ 7596; *Blake* sta. 41, 23°42′N, 83°13′W, 1,573 m.—1 specimen, UMML 30.7692; *Gerda* sta. G-963, 23°41′N, 82°16′W, 1,441–1,454 m; 10 foot otter trawl; February 1, 1968.—7 specimens, UMML 30.8149; *Gerda* sta. G-960, 23°30′N, 82°35′W, 1,692–1,697 m; 10 foot otter trawl; January 31, 1968.—5 specimens, UMML 30.8148; *Gerda* sta. G-959, 23°25′N, 82°26′W, 1,830 m; 10 foot otter trawl; January 31, 1968.—6 specimens, MCZ 135024; *Atlantis* sta. 2993, 23°24′N, 80°44′W, 1,061 m; 14 foot Blake trawl; March 15, 1938.—1 specimen, MCZ 135022; *Atlantis* sta. 2987E, 23°19′N, 79°59′W, 576 m; 14 foot Blake trawl; March 13, 1938.—1 specimen, MCZ 135023; *Atlantis* sta. 2988, 23°15′N, 79°57′W, 695 m; 14 foot Blake trawl; March 14, 1938.—1 specimen (lost), MCZ 7598 (? holotype of *Seguenzia delicatula*); 1 specimen, USNM 94943; *Blake* sta. 2, 23°14′N, 82°25′W, 1,472 m.—1 specimen, MCZ 135021; *Atlantis* sta. 2989, 23°10′N, 80°04′W, 658 m; 14 foot Blake trawl; March 14, 1938.—11 specimens, MNHN; *Alaminos* sta. 66-A9-15, 28°13.5′N, 87°04′W, 1,200–800 m; 10 ft midwater trawl; 1967.—Fragments, USNM 93805; *Albatross* sta. 2384, 28°45′00″N, 88°15′30″W, 1,719 m; large beam trawl; March 3, 1885.—3 specimens, MNHN; *Alaminos* sta. 69-A11-7, 27°01.3′N, 94°43.5′W, 1,399 m; 3 m benthic skimmer; 1969.—3 specimens, TAMU 4-1950; *Alaminos* sta. 69-A11-74, 21°29′N, 96°41.5′W, 1,189–1,280 m; 3 m benthic skimmer; August 22, 1969.—1 specimen, UMML 30.8153; *John Elliott Pillsbury* sta. P-585, 21°02′N, 86°29′W, 567–570 m; 10 foot otter trawl; May 23, 1967.—1 specimen, MCZ 135261; *Atlantis* sta. 3370, 20°47′N, 75°11′W, 829 m; 14 foot Blake trawl; April 20, 1939.—1 specimen, USNM 429445; 12 specimens, USNM 429465; 3 specimens, USNM uncatalogued; Johnson-Smithsonian Deep-Sea Expedition sta. 67, 18°30′12″N, 65°45′48″W, 329–512 m; 4 foot dredge; February 23, 1933.—1 specimen, BM(NH) 1887.2.9.351 (lectotype); 1 specimen, BM(NH) 1887.2.9.352 (paralectotype); *Challenger* sta. 24, 18°30′30″N, 65°05′30″W, 713 m; March 25, 1873.—1 specimen, USNM 214142; *Albatross* sta. 2750, 18°30′N, 63°31′W, 913 m; 2 foot ship's dredge; November 27, 1887.—2 specimens, UMML 30.8327; *John Elliott Pillsbury* sta. P-988, 18°29.3′N, 63°24′W, 686–723 m; 5 foot Blake trawl; July 23, 1969.—2 specimens, UMML 30.8328; *John Elliott Pillsbury* sta. P-1255, 17°18′N, 78°32′W, 23–622 m; 10 foot otter trawl; July 14, 1970.—4 specimens, UMML 30.8155; *John Elliott Pillsbury* sta. P-1261, 17°13′N, 77°50′W, 595–824 m; 10 foot otter trawl; July 15, 1970.—14 specimens, USNM 95399; 9 specimens, USNM 614087; *Albatross* sta. 2751, 16°54′N, 63°12′W, 1,257 m; large beam trawl; November 28, 1887.—1 specimen, MCZ 7597; *Blake* sta. 163, 16°03′10″N, 61°52′20″W, 1,407 m; January 20, 1879.—1 specimen, UMML 30.8154; *John Elliott Pillsbury* sta. P-861, 12°42′N, 61°05.5′W, 18–744 m; 10 foot otter trawl; July 4, 1969.—2 specimens, USNM 94942; *Blake* sta. 264, 12°03′15″N, 61°48′30″W, 767 m; March 1, 1879.—1 specimen, USNM 96876; *Albatross* sta. 2754, 11°40′N, 58°33′W, 1,609 m; large beam trawl; December 18, 1887.—Fragments, BM(NH) 1887.2.9.353; *Challenger* sta. 120, 8°37′S, 34°28′W, 1,235 m; September 9, 1873.—11 specimens, USNM 150756; *Albatross* sta. 2760, 12°07′S, 37°17′W, 1,864 m; large beam trawl; December 18, 1887.

Description: Shell small (height of largest specimen 7.2 mm, width 8.2 mm), conical, peripherally carinate, polished, white, iridescent under thin outer porcelaneous layer. Protoconch 375–450 μm (usually about 425 μm) in maximum diameter, prominent, glassy. Teleoconch whorls 7.5–8.0; spire whorls flat, with widely spaced (2–4 per mm) sigmoid axial riblets and fine spiral threads; sculpture usually strongest near suture and periphery, obsolete medially on whorls 3–6, becoming distinct again on whorls 7–8; suture distinct but not impressed. Periphery marked by strong carina, overlain by about 4 spiral threads, rendered strongly denticulate by the axial riblets, visible on all whorls. Base almost flat, often smooth medially, otherwise with strong spiral cords and obscure transverse threads in striae between spiral cords; sculpture stronger near umbilicus. Umbilicus wide, approximately 24% maximum shell diameter, bounded peripherally by strong, tuberculate spiral cord. Aperture subrectangualr, lips thin; outer lip bisinuate, with peripheral spur, and with wide, moderately deep, U-shaped posterior sinus, abapertural edge of which slightly flared; basal lip with wide, shallow, sinus, with weakly flared edges, apex in outer third of lip; columella straight, slightly oblique, distinctly inflated medially, terminating in rounded boss.

Animal occupies approximately 2 whorls, with estimated length of 8–10 mm. Epipodium prominent, flaplike, bearing 4 (probably 5) epipodial tentacles, ante-

riormost and posteriormost rather long, slender, middle 2 (or 3) much shorter. Esophagus running posteriorly from buccal area, making sharp ventral turn at level of last intestinal loop, then running posteriorly along ventral margin of right intestinal tract. Intestine very long, probably 15–20 mm total length when complete, running forward along left side of animal, forming series of tight convolutions and loops in anterior 2–3 mm, abruptly crossing to right side approximately 2 mm posterior to mantle edge, making short, tight dorsal loop before running posteriorly in series of strong sinuations; at some point posterior to preserved sections, intestine makes sharp U-turn, running anteriorly along left side of animal, the 2 sections closely appressed posteriorly, then separated by intervening structures anteriorly; about 3 mm posterior to mantle edge it makes 2 tight right-left loops, then runs straight along left side for about 2 mm, turning sharply right for about 0.5 mm, finally running anteriorly for final 1.5 mm; anus lying just posterior to edge of mantle on right side of animal. A 3 mm long fragment from near posterior reach of intestine contained some loops of intestine and/or esophagus ventrally and an ovate, 1.75 mm long organ that occupied the same relative position as the kidney of *Seguenzia cf.* sp. *S. eritima* (see Quinn, 1983b: fig. 34), but was solid and evenly rounded, rather than delicate and somewhat lobulate as in the *Seguenzia* species. No other features were observed because of poor preservation. Radula lost during preparation for SEM.

"The operculum is circular, very thin, concave, of about four whorls. The radula . . . has a rhachidian with a triangular cusp finely denticulated on the sides, a wide lateral with an inwardly directly [*sic*, directed] triangular cusp denticulated on both sides, and several (6 or 7) marginals, flat and rather narrow, denticulated along most of the outer edge but on the inner edge only near the tip" (Bayer, 1971:124).

Measurements: Lectotype [BM(NH) 1887.2.9.351; here designated]: 6.3 mm high, 5.9+ mm wide. Largest specimen: 7.2 mm high, 8.2 mm wide.

Type-locality: NW of St. Thomas, Virgin Islands, *Challenger* sta. 24, 18°30′30″N, 65°05′30″W, 713 m (here designated).

Remarks: All four species of *Hadroconus* are very similar morphologically. *Hadroconus sibogae* (Schepman, 1908), from Makassar Strait, off Celebes Island, Indonesia, differs from the three western Atlantic species in that it totally lacks spiral sculpture on the upper whorl surface, except for "one or two spiral elevated striae . . . on part of the upper whorls" (Schepman, 1908:62–63). The three western Atlantic species are more difficult to distinguish from each other, especially because of the intraspecific variation of shells of *H. altus*. Discussions and analyses of characters distinguishing *H. altus* from *H. watsoni* (Dall, 1927) and the undescribed species will be presented in a future paper revising the western Atlantic *Hadroconus*.

Intraspecific variation in shells of *H. altus* is extensive. The height : width (h:w) ratio varies from 0.68 to 1.07 ($\bar{x} = 0.85 \pm 0.10$; N = 22); the lower the ratio, the more distinctly concave the spire outline becomes. In a manner similar to that of the spiral sculpture above the periphery, the basal spiral cords tend to become obsolete on the medial part of the base. This smooth area varies from 15% to 47% ($\bar{x} = 28.5\%$) of the umbilicus–periphery distance. In a few specimens [BM(NH) 1887.2.9.351–352, and UMML 30.8018, 30.8151, and 30.8155], the basal spiral cords are all strong and separated by strong grooves. These specimens also had the highest h:w ratios (0.97–1.07) and some of the smallest protoconchs (375–400 μm), but these values were not significantly different from those of the lower spired forms (Student's t; $P < 0.05$).

Hadroconus altus is known from the Bahamas, Straits of Florida, Gulf of Mexico, Yucatan Channel, the entire Antillean Arc, and off Brazil. Bathymetric occurrence is about 500–700 m in the northern Straits of Florida, and generally deeper than 1,000 m elsewhere, with the deepest record (2,276–2,360 m) in the southern Straits of Florida. Depths of the three lots with live-collected specimens were 805–722 m (UMML 30.8328, P-1255), 1,200–800 m (MNHN, *Alaminos* sta. 66-A9-15), and 1,390–1,414 m (UMML 30.8150, G-964). *Hadroconus altus* thus seems to inhabit depths considerably greater than those in which either of the other western Atlantic species live (*H. watsoni*: approximately 430–805 m; *Hadroconus* n. sp.: 329–512 m; personal observations).

Rotellenzia new genus

Basilissa: Watson, 1879:593 (*partim*); 1886:96 (*partim*).—Schepman, 1908:61 (*partim*).—Cotton, 1959:189 (*partim*).

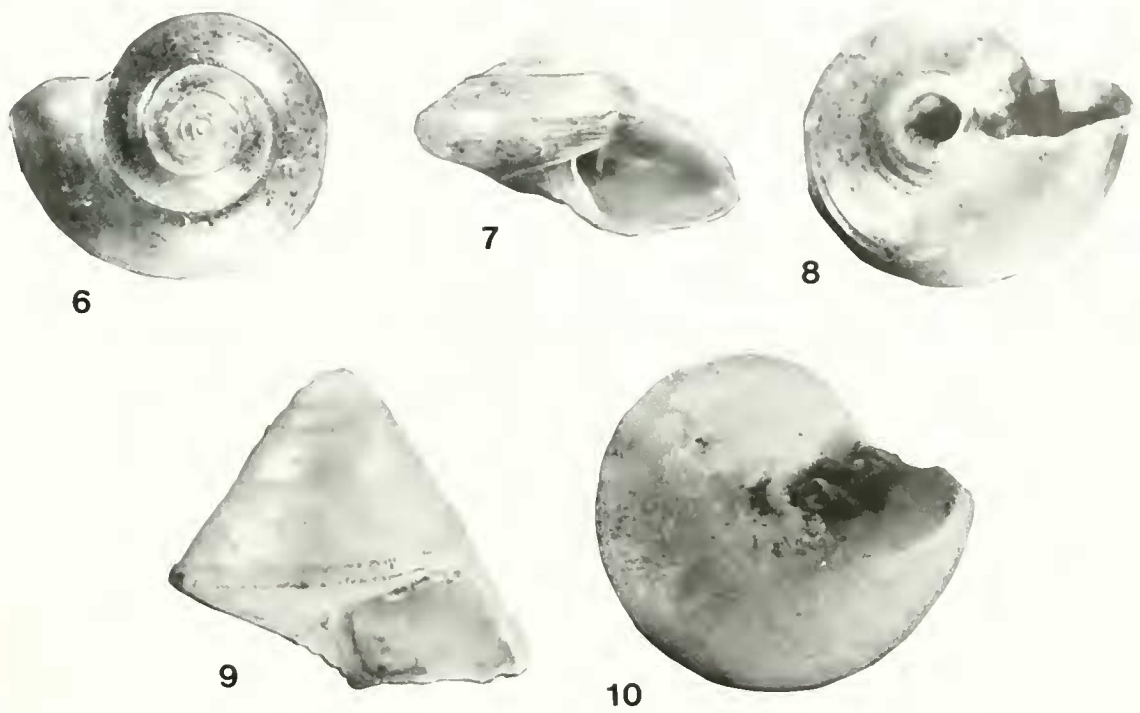
Seguenzia Group II: Quinn, 1983b:728 (*partim*).

Type-species: *Basilissa lampra* Watson, 1879; here designated.

Gender: Feminine.

Diagnosis: Shell of moderate size, depressed conical, weakly carinate peripherally, fragile, brilliantly iridescent under very thin outer porcelaneous layer, color brassy; spire almost flat-sided, sutures weakly impressed; whorls with 2 weak carinae at periphery, visible only on last whorl, with numerous spiral threads above peripheral cords, strongest on first 3 whorls, obscure subsequently; axial sculpture of low riblets on first 1.5 whorls, thereafter almost absent; base weakly convex, with numerous spiral threads, umbilicate; umbilicus wide, defined by strong, smooth spiral cord; aperture rhomboidal; lips thin with broad, V-shaped posterior sinus, and broad, very shallow, U-shaped basal sinus; anterolateral sinus, if present, probably narrow, shallow and U-shaped; columella thin, very weakly sigmoid, edentate.

Remarks: The shell of the type-species of this genus is most similar to those of species of *Seguenziella* Marshall, 1983. *Rotellenzia lampra*, however, lacks the strong mid-whorl and peripheral carinae which characterize *Se-*



Figures 6–8. *Rotellenzia lampra* (Watson, 1879). Apical, apertural, and basal views of holotype of *Basilissa lampra*, BM(NH) 1887.2.9.348, height 7.5 mm, maximum diameter 12.2 mm. **Figures 9, 10.** *Asthelys munda* (Watson, 1879). Apertural and basal views of holotype of *Basilissa munda*, BM(NH) 1887.2.9.350, height 3.0 mm, maximum diameter 3.3 mm.

guenziella. Moreover, if Schepman's (1908: text fig. 1) illustration of the radula of *R. lampra* is accurate, the odd structure of the cusps of the rhachidian and laterals further separates the two genera. However, the two genera undoubtedly are closely related, and, on the evidence of the radula, both are more closely allied to *Seguenzia* Jeffreys, 1876, than to other genera with similar shell shapes, such as *Carenzia* Quinn, 1983. If the similarities of shells hold between *Rotellenzia* and *Seguenziella*, a narrow, U-shaped anterolateral labral sinus probably exists. However, the chipped lip of the holotype of *R. lampra* prevents direct observation of this feature, and the growth lines give no additional indication, a situation also found in *Seguenziella*.

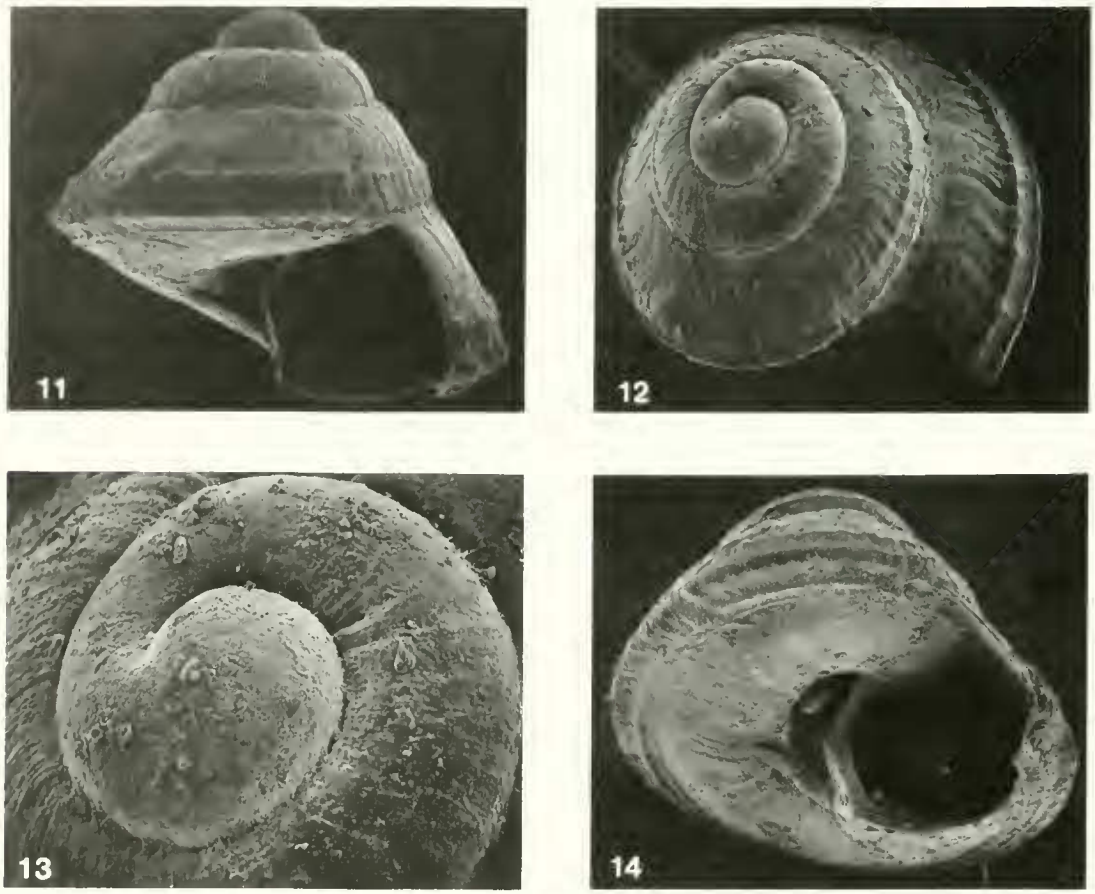
Etymology: From the Latin diminuative of *rota*, a wheel, and *Seguenzia*, a genus of Seguenziidae.

Rotellenzia lampra (Watson, 1879)
(figures 6–8)

Basilissa lampra Watson, 1879:593; 1886:97, pl. 7, fig. 5.—Schepman, 1908.61, text fig. 1.—Cotton, 1959:189.
Seguenzia lampra: Quinn, 1983b:728, fig. 45.

Material examined: 1 specimen, BM(NH) 1887.2.9.348 (holotype); *Challenger* sta. 246, 36°10′N, 178°00′E, 3,749 m; July 2, 1875.

Description: Shell of moderate size (height 7.5 mm, width 12.2 mm), depressed conical, weakly carinate peripherally, umbilicate, thin, iridescent under very thin porcelaneous layer, brass-colored. Protoconch large, about 500 μm in maximum diameter, about 1 whorl. Teleoconch whorls 5.25, spire whorls flat to weakly convex; first 3 whorls with fine, sharp spiral threads, one at midwhorl strongest, subsequent whorls with spirals subequal in strength, all becoming weaker over last 2 whorls; threads number 19 near aperture; last whorl with 2 strong, smooth spiral cords, anterior one peripheral, posterior one close above and along which suture runs, interspace narrow, weakly concave; axial sculpture of low, sharp collabral riblets on first 1.5 whorls, thereafter rapidly disappearing, except near suture where they remain evident as short, comma-like folds. Base weakly convex, umbilicate, with 15 spiral cords (increasing rapidly near aperture to 25), outer 3 rather strong, separated by concave interspaces bearing 3–4 fine spiral threads near aperture, middle 75% of base with 9 broad, flat spiral cords separated by shallow striae, inner 3 cords strong, sharp, separated by concave interspaces with fine, sharp transverse riblets. Umbilicus wide, about 30% maximum shell diameter, funnel-shaped, walls weakly concave, smooth except for growth lines. Aperture trapezoidal; outer lip thin, posterior sinus shallow, broadly V-shaped, apex in posterior 25% of whorl; basal lip thin, basal sinus a wide, very shallow sinuation of lip, apex located in abaxial quarter of base; columella thin, weakly concave in adapical half, weakly convex in abapical half. Operculum unknown. Radula with lanceolate rhachidian, cusp not reflected, finely denticulate along cusp base, unarmed



Figures 11–14. SEM micrographs of *Asthelys munda* (Watson, 1879) from *Porcupine* station 22, USNM 859916. **11.** Apertural view, × 45.5. **12.** Oblique apical view, × 42. **13.** Protoconch, × 126. **14.** Oblique basal view, × 45.5.

distally; lateral with wide, triangular base, long, unreflected cusp on proximal side, finely denticulate along distal edge well back from tip; inner marginal sickle-shaped, edentate.

Measurements: Holotype: height 7.5 mm, width 12.2 mm.

Type-locality: NW of Midway Island, Hawaiian Islands, *Challenger* sta. 246, 36°10′N, 178°00′E, 3,749 m.

Remarks: See under generic remarks.

Asthelys new genus

Seguenzia: Jeffreys, 1877:320 (*partim*).
Basilissa Watson, 1879:593 (*partim*); 1886:96 (*partim*).—Quinn, 1983b:729 (*partim*).

Type-species: *Basilissa munda* Watson, 1879; here designated.

Gender: Feminine.

Diagnosis: Shell small, conical, peripherally bicarinate, umbilicate, nacreous under thin outer porcelaneous layer white; protoconch large; first 0.5 whorl lacking spiral sculpture, subsequent whorls with strong cord above periphery and strong peripheral cord, together forming weakly bicarinate periphery, weak to strong spiral cords on base, and strong, smooth or pustulate circumumbilical cord; axial sculpture of obscure, sigmoid folds and growth lines; surface microsculpture of microscopic, shallow punctae; base weakly convex; umbilicus narrow, funnel-like; aperture subquadrate; labral sinuses 2, wide, shallow; columella straight or weakly concave. Radula unknown.

Remarks: *Asthelys* most closely resembles *Thelyssina* Marshall, 1983. Shells of both genera are conical with almost flush sutures, lack a midwhorl carina, spiral cord, or angulation on the first teleoconch whorl immediately following the termination of the protoconch, lack strong collabral and spiral microsculpture above the whorl periphery, and have a narrow, funnel-like umbilicus. The type-species of *Asthelys* differs from that of *Thelyssina* by lacking a trochoid tip and terminal rim on the protoconch, having minute punctae instead of vermiculate microsculpture on the first two spire whorls (although *T. sterrha* Marshall, 1983, also has punctations, *fide* Marshall, personal communication), having a bicarinate rather than unicarinate periphery, having a distinct posterior

shell sinus, persistence of the initial spiral cord on all teleoconch whorls, and lacking a strong parietal callus. At least two other species may also be assigned to *Asthelys*: *Basilissa simplex* Watson, 1879, and an undescribed Antarctic species (Marshall, personal communication).

Etymology: Anagram of *Thelyssa*, a genus of Seguenziidae.

Asthelys munda (Watson, 1879)
(figures 9–14)

Seguenzia carinata Jeffreys, 1877:320 (*partim*).
Basilissa munda Watson, 1879:596; 1886:99, pl. 7, fig. 7.—Quinn, 1983b:729. [*Non Basilissa munda* Barsanova, 1966: 150 (misidentification).]

Material examined: 1 specimen, USNM 859916 [(paralectotype of *Carenzia carinata* (Jeffreys, 1877)]; *Porcupine* sta. 22, 56°08′N, 13°34′W, 2,311 m; July, 1870.—1 specimen, BM(NH) 1887.2.9.350 (holotype); *Challenger* sta. 85, 28°42′N, 18°06′W, 2,058 m; August 29, 1873.

Description: Shell very small (height of holotype 3.0 mm, width 3.3 mm), conical, weakly bicarinate peripherally, narrowly umbilicate, thin, iridescent under thin outer porcelaneous layer, white. Protoconch with irregular microsculpture, about 350–375 μm maximum diameter, of about 1 whorl, lacking terminal rim. Teleoconch whorls 4.75; spiral sculpture absent on first half-whorl; fine spiral thread appears on second half-whorl, located at abapical fifth of whorl, gradually strengthening to become subequal to peripheral cord; peripheral cord visible only on last whorl, forming bicarinate periphery with upper spiral cord; axial sculpture present on all whorls, consisting of extremely obscure sigmoid folds, most apparent as undulations of spiral cords; surface microsculpture of microscopic, extremely shallow punctae generally arranged in spiral pattern. Base weakly convex, with 11 spiral cords, innermost strongest, with 8 pustules, and sigmoid transverse rugae and minute punctae. Umbilicus narrow, about 14% of maximum shell diameter, funnel-shaped, walls smooth except for axial growth lines. Aperture subquadrate; outer lip thin, with very wide, shallow, U-shaped posterior sinus, apex located above midwhorl; basal lip thin, with very wide and shallow basal sinus, apex at abaxial third of base; columella almost straight, very weakly concave above, very weakly convex below, slightly thickened, edentate.

Type-locality: W of Palma, Canary Islands, *Challenger* sta. 85, 28°42′N, 18°06′W, 2,058 m.

Remarks: *Asthelys munda* is most similar to *A. simplex* (Watson, 1879), but *A. munda* is smaller, relatively broader, lacks a subsutural spiral cord, and has weaker basal spiral cords, pustulate circumumbilical cord, and less oblique aperture. The specimen from the *Porcupine* Expedition is a juvenile (figures 9–12) from the syntype lot of *Carenzia carinata* (Jeffreys, 1877). The locality of this specimen (NW of Ireland) extends the known range of the species northward more than 2,600 km, indicating a distribution throughout the northeastern Atlantic in depths of about 2,000 m.

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